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3. **National Trust for Places of Historic Interest or Natural Beauty.**
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# NEW CULICINI FROM KENYA AND UGANDA.

By Mrs. E. C. C. van Someren.

(*Division of Insect-borne Diseases, Medical Research Laboratory, Nairobi, Kenya.*)

## **Aedes (Stegomyia) heischi** sp. n.

This mosquito is very like *A. deboeri* subsp. *demeilloni* Edwards, but can usually be differentiated by having some silvery scales in the middle of the mid femur anteriorly.

*Female. Head.*—Ground colour black with 2 large silvery white, lateral patches, a line of silvery white scales round eye margins, and 2 median white lines. Tori, proboscis and clypeus black; clypeus bare and tori with silvery white scales. Palpi black with broad white tips.

*Thorax.*—Scutum covered with narrow black scales and ornamented with silvery scales as follows: A patch of narrow white scales in the middle of the front margin; 2 large pear-shaped silvery white lateral patches, rather rounded before and behind, reaching margin at scutal angle and for a short distance in front; 2 short posterior lateral white lines, which may have a yellow sheen and which do not reach the points of the lateral white patches; scales round bare space white; a posterior median white or yellow line which is usually very short, not reaching beyond the ends of the lateral white lines, but occasionally indicated narrowly to a half and sometimes extending faintly to the front margin; pre-alar white areas well defined, but not reaching lateral white lines. Scutellum covered with broad silvery scales except for a border of broad black scales on the distal margin of mid lobe. Scales on *apn* silvery; *ppn* with a small patch of silvery scales below and black ones on the upper margin. Sternopleurae and mesepimeron with large patches of silvery scales. Knob of halteres black with silvery scales at tip. *Abdomen* black with large silvery white basal lateral spots on tergites 1–7, those on seventh segment visible dorsally. Tergite 3–6 with well-defined silvery white basal bands; tergite 2 may have a silvery white band as on the other segments, but sometimes this band very broken and narrow; tergite 7 with a median basal silvery patch. Sternites black with basal silvery white bands on segments 2–7 or only 4–7. *Legs* black with white markings. Fore femora with a narrow silvery ventral line on the basal half; mid femora with a small or large median patch on the anterior surface which may extend back towards the base (this patch absent on one specimen), and with a small silvery patch above at tip extending back on to anterior surface and sometimes meeting a short silvery ventral apical line; hind femora with the posterior surface white on the basal half, apical half black; anterior surface white at base to over a half, the white area turning up towards the dorsal surface distally, a dark dorsal line on the apical two-thirds and the small silvery spot at the apex above extends on to the anterior surface to form a backward-pointed streak. Fore tibiae with a narrow white band at the base; mid-tibiae with, or sometimes without, a small white spot behind at base; hind tibiae with a short, narrow, ventral white stripe on the basal one-sixth, not visible on the anterior surface. Fore tarsi with narrow basal white bands on the first two segments only; mid tarsi sometimes with only a narrow white basal band on the first segment, but usually the white markings continued to a half or nearly to the tip behind, second segment like the first, 3–5 all black; hind tarsi with narrow basal white bands on segments 1–3, 4 all white or with a black spot below at tip, 5 white with a black tip. *Wing* scales all black.

*Male.*—Palpi with only one white band on the shaft and a basal white patch above. Otherwise, as in the female, but differs slightly as follows: Black areas on the vertex

sometimes greatly reduced to small black spots. Posterior lateral white lines on the thorax wider than in the female and the median white line usually distinctly continued to meet the spot on the front margin, only occasionally stopping short on the posterior half. Supra-alar patches large but not meeting lateral white lines. *Terminalia.*—Essentially the same as those of *A. deboeri* (Edwards, 1941). Basal plaque large and hairy, but not reaching to the apex of the coxite ; 2 or 3 small spines placed on a slight elevation on inner edge ; teeth of phallosome recurved and 2 distinctly longer than the rest. Lobes of tergite with 4–6 hairs.

*Pupa.*—Very like that described by Edwards (1941) for *A. dendrophilus.* Paddles may or may not be notched at the apex, and are of variable shape ; sometimes broad and rounded at tip or narrow and pointed at tip.

*Larva.*—I have been able to compare this larva with some *demeilloni* pelts and associated adults from Eshowe, Zululand, and although they are very similar, the *demeilloni* larvae examined differ from the description given by Hopkins (1935) by having the lower caudal seta 2–3-branched and thus differs from the larva described here, which has this seta single. From the very similar larva of *A. keniensis* van S. it differs by having large curved spines at the bases of the meso- and metathoracic pleural groups of hairs.

*Head.*—Antennae short and cylindrical and with a short single seta just beyond a half. Seta A with 2 branches, B single, C single or bifid beyond a half, *d* with 2-4 branches, *e* and *f* single. Mentum with 11 teeth on either side of the central tooth, the basal 3 wider spaced and larger except for the lowest tooth, which is very small. *Thorax* with large, curved, rose-thorn spines at the bases of the meso-and metapleural groups of hairs. Thorax and abdomen often covered with numerous stellate setae, but sometimes these setae very much reduced. *Abdomen.*—Comb a curved row of 8–12 spines, which have a large, strong, basal denticle on either side, giving it a trifid appearance, and with a few finer basal denticles. Siphon dark or pale brown, with an index of about 2 ; pecten of 6–13 spines, usually 1 and occasionally 2 placed beyond the subventral tuft ; these spines triangular, with fine denticles on either side ; subventral tuft of 2–4 branches, usually 2. Anal segment with well-developed saddle, but not complete ; lower caudal seta single, upper with 2–3 branches ; lateral seta with 3–4 branches, usually 3, and about one and a half times the length of the saddle ; brush with 4 paired setae of 2 or sometimes 3 branches. " Gills " round-tipped, subequal and upper pair one and a half to four times the length of the saddle.

Described from holotype, allotype, 27 male, 35 female paratypes, paedotype and 50 associated pupal and larval pelts, and numerous whole larvae. Breeding in tree-holes Taveta, Kenya, East Africa. The holotype, allotype, paedotype and 33 paratypes have been presented to the British Museum.

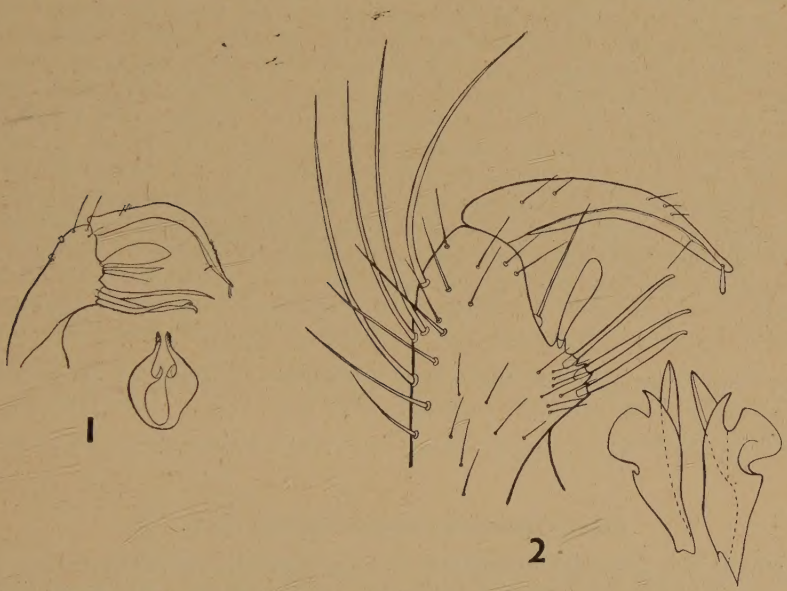
This mosquito has been named for Dr. R. B. Heisch, Senior Parasitologist, Nairobi, Kenya.

### Culex (Culiciomyia) mongiro sp. n.

This species is very similar to *C.* (*C.*) *subaequalis* Edwards, having the penultimate segment of the male palpi three-quarters the length of the apical segment and the outstanding scales on the shaft all sharp pointed. It is distinguished from *C. subaequalis* on the character of the male terminalia and by the ornamentation of the abdomen, which has distinct apical lateral patches of pale scales on tergites 4–7 and distinctly banded sternites.

*Male. Head.*—A patch of broad white scales on either side is continued in a band round the eye margins ; decumbent scales on vertex narrow and white ; upright scales pale brown. Palpi and proboscis dark ; palpi with 11–14 sharp pointed, outstanding scales on the apical half of shaft and penultimate segment three-quarters the length of the terminal. *Thorax.*—Integument dark brown, pleurae not much lighter than the scutum and not definitely

marked. Scutum covered with narrow light brown scales; acrostichial bristles small. Pleurae bare of scales except for sternopleurae, which have a small patch of scales above and a line of broad scales on the lower edge. *Legs* dark brown except for a pale line on the undersides of femora. Hind femora also creamy white on nearly the whole of the anterior surface, on about the distal half posteriorly, and with a dark dorsal line on the apical two-thirds. *Abdomen* dark blackish brown above, with apical lateral white patches on tergites 3–7; sternites dark, with distinct white apical bands. *Terminalia* (fig. 1).—Differ from those of *C. subaequalis* on the character of the *lp*, the finger-like process of which is tuberculate at tip, and the paraprocts have no arm. Coxite with ventro-lateral hair patch; lobe with a broad and a narrow leaf and an associated stiff hair above, and 3 long rods below, the lower one rather different from that of *C. subaequalis*, being longer, curved, and not blunt tipped.




FIGS. 1–2.—Male terminalia of (1) *C.* (*C.*) *mongiro* sp. n.; (2) *C.* (*C.*) *pseudopruina* sp. n.

A female from Mongiro, Bwamba (April, 1944), is probably this species and is as described for the male, but the narrow decumbent scales on the vertex are darker, more golden than creamy white, and the abdominal sternites are white with broad median dark triangles.

Described from holotype and 1 male paratype from Mongiro, Bwamba, Toro District, Uganda, April, 1944. Both these specimens and the female are in the British Museum.

**Culex (Culex) pseudopruina** sp. n.

A pale-coloured mosquito very like *C.* (*C.*) *pruina* Theobald, but differentiated by the male terminalia, which are of the *pruina-philipi* type, having no trace of *d*, *e* or *f* on the lobe of the coxite.

On external characters it differs from *C.* (*C.*) *philipi* Edwards by having the scutal scales all creamy white and from *C. pruina* on the character of the male palpi, which are shorter, being longer than the proboscis by the terminal segment and only one-third the penultimate.

*Female.*—Unknown.

*Male. Head.*—All decumbent scales on the head pale, broad and whitish at the sides and narrow and creamy white on the vertex ; upright scales sandy coloured in front, with a few dark ones on nape. Tori and clypeus pale sand colour. Proboscis and palpi dark brown throughout ; palpi longer than the proboscis by terminal segment and one-third the penultimate. *Thorax.*—Integument of scutum and pleurae a pale parchment colour with the scutum usually darkened in the middle and posteriorly, leaving a large pale area in front of shoulders. Scutal scales narrow and creamy white. Pleurae bare of scales except for one or two on upper sternopleurae and only one lower mesepimeral bristle present. Halters yellow. *Legs* dark brown except for undersides of femora and sometimes tibiae and tarsi tend to be lighter below. Hind femora with a dark dorsal line on the apical half, white on anterior surface to near tip, and on basal two-thirds of posterior surface. *Abdomen* dark brown above and pale creamy white below ; tergites 6 and 7 with large basal patches of creamy scales and sternites tend to have dark apical bands. *Terminalia* (fig. 2) differ from *C. pruina* on the shape of the style, which is evenly curved and tapering and by having a narrow leaf on the lobe of the coxite and a fairly long, narrow basal arm to the paraprocts. From *C. philipi* it differs in having the inner division of the phallosome well developed and long. Coxite long, narrow and hairy ; lobe not divided and only just indicated with 3 long, straight rods, which are slightly curved at the tips, a fairly long, narrow leaf, and *h* stout and straight. Style stout and evenly curved and tapered. Paraprocts with well-developed basal arm ; phallosome with inner division well developed.

Described from holotype and 4 male paratypes collected by Dr. Haddow from Bwamba, Toro District, Uganda. The type and 3 paratypes are in the British Museum.

### Culex (Neoculex) kanyamwerima sp. n.

A small dark mosquito resembling *C.* (*N.*) *albiventris* Edwards and *C.* (*N.*) *adersianus* Edwards by having broad scales on the vertex and no acrostichial bristles, but differentiated on the character of the male terminalia.

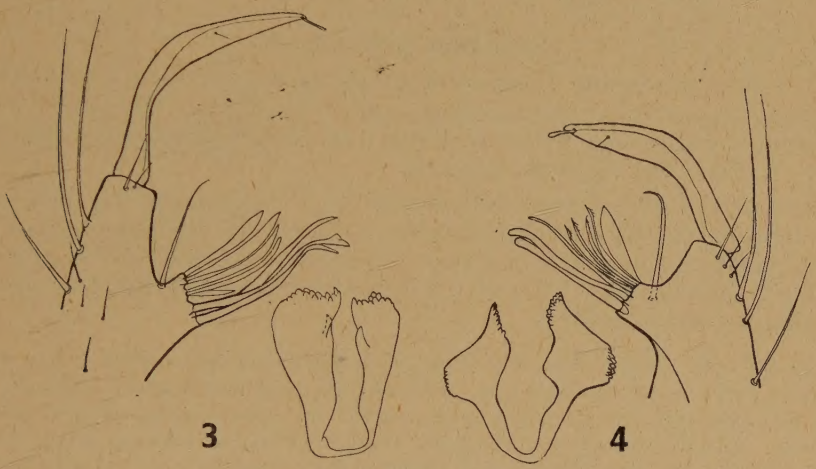
The female described below is attributed to this species, as it resembles the male and differs from *C. albiventris* by having the seventh sternite all white scaled and from *C. adersianus* by having no pale apical lateral spots on tergite seven.

*Male. Head.*—All decumbent scales whitish ; a band of broad white scales round eye margins and some broad scales on vertex. Proboscis and palpi dark brown ; palpi shorter than proboscis, smooth and fairly straight. *Thorax.*—Integument shining and dark brown. Scutum sparsely covered with narrow dark brown scales dorsally and with creamy scales round front margin and laterally ; no acrostichial bristles present. Pleurae bare of scales except for a narrow line of broad pale scales on lower edge of sternopleurae. *Abdomen* rather shrivelled and only segments 1–5 remain, but appears to be dark brown above and pale below. *Legs* dark brown, but all femora with a white line below, also hind femora white posteriorly on a little more than the basal half, with a dark dorsal line on the apical half, and the anterior surface practically all white. *Terminalia* (fig. 3).—Style not greatly widened beyond the middle. Coxite long and narrow ; lobe with 3 long, curved rods, one with a membranous tip, and 4 shorter, flattened blades behind which, on external

surface, there is a very short, narrow, pointed leaflet and a long, stout, curved hair. *lp* long, fairly broad and tuberculate at tip.

*Female.*—As described for the male, but the scales on the vertex are brown, except for a band of broad white scales round the eye margins and there are no pale scales on the scutum. The abdominal tergites 2–6 have apical lateral white patches and sternites 2–7 are all white.

Described from holotype from Kanyamwerima and the female from Kilara, Bwamba, Toro District, Uganda, June, 1948. Both specimens are in the British Museum.




FIGS. 3–4.—Male terminalia of (3) *C.* (*N.*) *kanyamwerima* sp. n.; (4) *C.* (*N.*) *kilara* sp. n.

### Culex (Neoculex) kilara sp. n.

A small brown species with small but distinct creamy white spots on the apical corners of the tergites. It is very similar to *C.* (*N.*) *kingianus* Edwards, but differs on the length of the palpi and on the character of the male terminalia.

*Male. Head.*—Decumbent scales creamy white, upright scales dark; the patch of broad flat scales on either side is continued upwards round eye margins as a narrow border to near mid line; rest of scales on vertex narrow. Palpi, proboscis and tori dark brown; palpi longer than proboscis by terminal segment and about half the penultimate, last two segments hairy and a few hairs at tip of shaft. *Thorax.*—Integument dark brown and shining, pleurae slightly lighter than scutum and unmarked. Scutum covered with narrow dark brown scales, some paler ones round front margin and laterally. Pleurae practically bare of scales, none on *apn*, *ppn* or lower mesepimeron, but with a few scales among the hairs on the upper mesepimeron, and sternopleurae with a patch of scales above and with a few scales on the lower posterior border. *Legs* dark brown except for a white line below on all femora. Hind femora also white on the anterior surface to near tip, on posterior surface on basal two-thirds, and with a dark dorsal line on the apical half. *Abdomen*—Tergites dark brown with small but distinct apical lateral creamy white spots on tergites 5–7; sternites mainly pale, but with basal dark markings. *Terminalia* (fig. 4).—Style thick and curved. Coxite narrow distally; lobe with 3 long rods, 4 narrow blades, which are serrated on the upper distal edge, and a broad round tipped leaf, and a long curved

hair. *lp* very different from that of *C. kingianus*, being broad distally and tuberculate on the apical point and outside edge.

*Female.*—Not known for certain, but the one described below probably belongs to this species.

It agrees with the male except that the tergites 3 and 4, as well as 5–7, have apical lateral white spots; sternites creamy white with dark basal bands on 4–7. It differs from *C. kingianus* by having the palpi one-fourth the length of the proboscis.

Described from holotype, 8 male paratypes, and 2 females from Kilara, Bwamba, Toro District, Uganda, June, 1948. The holotype and 6 paratypes and the 2 females are in the British Museum.

### **Uranotaenia yovani** sp. n.

The adult is very like *U. ornata* Theobald, having the thorax light yellow with a dark brown patch on the posterior half of the scutum. The yellow scales on the head will separate it from *U. ornata* s. str., but it cannot be distinguished from *U. ornata* var. *musarum* Edwards.

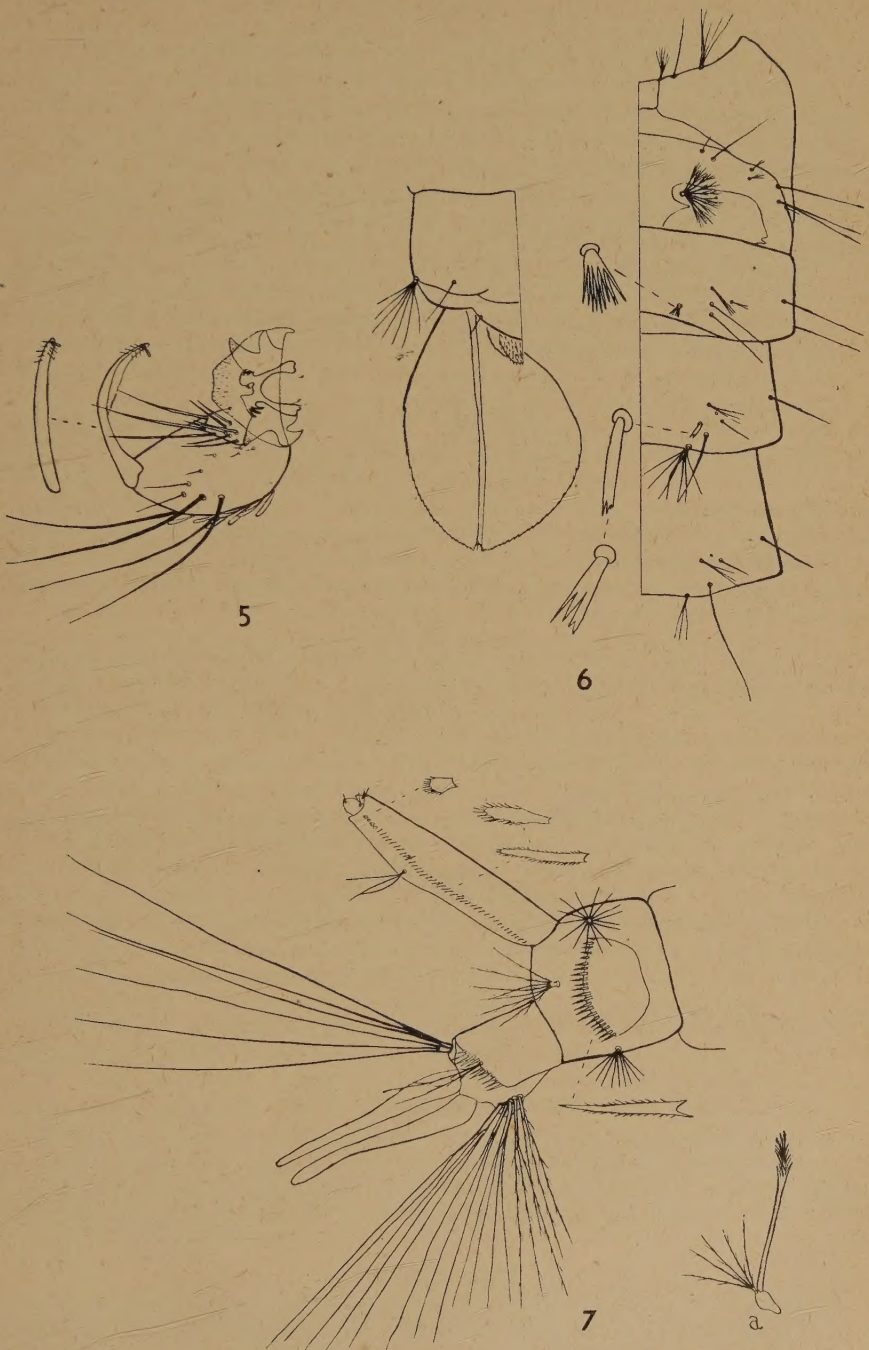
The early stages are easily distinguished from *U. ornata* and var. *musarum*. The larva on the character of the pecten which extends the full length of the siphon and is composed of long, narrow scales, not round ones, and the pupa by having the dorsal seta, C III, and A VIII multiple-branched (2–7, 3–10 and 5–10 branches respectively).

*Adult female. Head.*—With flat black and upright dark scales above and a small patch of yellow scales on either side. Tori, clypeus, palpi and proboscis blackish, but tori sometimes pale brown; first flagellar segment of antennae about equal to second segment. *Thorax.*—Scutum with short, fine acrostichial bristles and long, strong, dorsocentral bristles, all dark. Front half of scutum yellow and sparsely covered with narrow, pale yellow scales; posterior half with a semicircular brown patch having the outside edges dark brown and with two dark brown stripes on either side of the bare space and a black patch over wing roots, all scales on this area black and narrow. Scutellum with broad black scales and mid lobe with 4 long bristles. Pronotum yellow with two broad dark brown lateral stripes. Pleurae pale yellow, bare of scales, with one long dark mesepimeral bristle, and 6–7 fine hairs on posterior margin of sternopleurae; coxae yellow, with a patch of broad, blackish scales in front on fore and mid legs; trochanters yellow and covered with broad blackish scales. *Legs* all dark blackish brown. *Abdomen.*—Tergites dark blackish brown with small yellow basal patches on 3–7, those on 5–7 extending towards the midline as a narrow band, sometimes meeting, but usually not quite meeting in the middle; sternites yellow with broad, dark grey, apical bands more pronounced on the distal segments. *Wing* scales all dark; venation normal.

*Male.*—As female, but differs slightly as follows: Yellow scale patches on head sometimes larger; tergite 3 without a basal, yellow, lateral patch and 5–7 usually with broad yellow basal bands. *Terminalia* (fig. 5).—Very like those of *U. ornata* as described by Edwards (1941), no distinct difference being noted. The shape of the style varies as it is rotated. Seen from above it appears long, sinuous, broad at the base, and narrow apically, from the side it appears short, straight, and the same width throughout.

*Pupa* (fig. 6).—The nomenclature used to describe this pupa is that of Knight and Chamberlain (1948).

*Thorax.*—Scutal integument with two median dark lines and a short one on either side in line with the trumpets, which are short and dark. Setae rather short, hair 1, 2, 3 and 9 with 2–3 branches; 4 and 7 divided beyond the middle into 3–4 and 2–4 branches respectively; 5 with 6–10 branches; 6 a long, strong hair about twice the length of the others and single; 8 (dorsal seta of Edwards, 1941) with 2–7 branches, usually 6; 10 with 7–9




FIGS. 5–7.—*U. yovani* sp. n. (5) Male terminalia; (6) pupa; (7) larva—(*a*) propleural group of hairs.

branches about half the length of 11 and 12, which are single and with 3–5 branches respectively. *Abdomen.*—Integument with a median dark dorsal line on segments I–VI and dark lateral lines on segments I–IV. Hairless seta ring O present on segments III–V ; hair 1 present on II–VIII ; 7 single and long on I and II, shorter on III–VII ; 8 a very short fine hair on I–IV and a short spinous hair on V–VII. *Tergite I.*—Hair 2 a dendriform tuft of 16–17 branches ; 3 usually single but may be bifid or trifid beyond the middle and about one-third the length of 4, which is single ; 5 and 6 very short and with 2–4 branches ; 10 long, bifid or trifid. *Tergite II.*—Hair 2 and 4 short and single ; 3 a very short tuft of 6–9 strong, spinous branches, some of which are divided again distally ; 5 with 2–4 branches, above, and about twice the length of 6, which is single or with 2–3 branches ; 10 long and single. *Tergite III.*—Hair 2 (C III of Edwards) a tuft of 3–10 branches, some of which are divided again distally ; 3 a short thick spine, which is usually forked distally, but may be single or with 3–4 branches ; 4 a strong, curved, single seta about the same length as 2 ; 5 and 6 as on II, but 6 sometimes single. *Tergites IV–VII.*—Hair 2 with 2–4 branches or occasionally single and about half the length of 5, which is usually single but may be bifid or trifid, about the length of the segment on IV, and gradually decreasing in length on the other segments ; 3 a short spinous hair ; 4 placed above 2 and with 3–4 branches on IV and single or with 2–3 branches on V–VII ; 6 as on III. *Tergite VIII.*—Hair 5 single or bifid ; 8 (A VIII of Edwards) about two-fifths the length of the paddles and with 5–10 branches. *Sternites.*—Hair 13 present on III–VIII ; 9 and 10 with 2–4 branches, 9 shorter than 10 ; 11 present on II–VII short and single, 12 absent on II, single on the other segments and almost above 11 on VI and outside 11 on VII. *Paddles* pale, finely denticulate round edge on distal half, notched at apex, with a strong mid rib, and external buttress to a half.

*Larva* (fig. 7). *Head.*—Very round in uncrushed specimens, with the setae arranged as described by Hopkins (1936) for *U. ornata* var. *musarum*. A well-forward with 5–7 branches, B and C single, *d* bifid, *e* and *f* with 2–5 branches. Antennae very short, cylindrical, smooth, and with a fine, single seta below a $\frac{1}{2}$. Mentum rather long and narrow with 8 strong teeth on either side of the central tooth. *Thorax.*—Integument covered with stellate setae composed of many, strong, short, very finely plumose branches. Propleural group of hairs with well-sclerotized boss, a 5-branched plumose seta, and one short, strong seta upturned at tip, split distally into 2–3 dendriform branches and with numerous forwardly directed short, stiff hairs on distal $\frac{1}{4}$ below. *Abdomen.*—Covered with stellate setae as on thorax. Comb plate large and with 15–23 long, strong, fringed spines on distal edge. Siphon pale, slightly flattened dorso-ventrally, straight-sided dorsally, sigmoid ventrally (concave about the middle and convex below the tuft), and with an index of about 5 in whole larvae ; in specimens mounted with pressure the index is reduced to 3 and the shape of the siphon changes, the ventral surface appearing convex only. Pecten extending the whole length of the siphon, of 38–46 pale, finely fringed scales, mostly long and narrow, but a few short, broad ones at apex ; subventral tuft about one and a half times the length of the diameter of the siphon and with 2–4 (usually 3) fine, simple branches. Anal segment with an incomplete saddle the distal edge of which is fringed with long spines ; lateral seta one and a half times the length of the saddle and usually with 2 (occasionally 3) stout, finely plumose branches ; lower caudal seta with 2–4 branches, upper with 3–4 ; brush with 5 paired, 3–6-branched tufts in the barred area and the branches of the shorter tufts plumose. " Gills " long, narrow, and about two and a half times the length of the saddle.

Described from holotype, allotype, 6 female and 5 female paratypes, paedotypes, 8 larval and 11 pupal pelts and a few whole larvae. Bred from larvae collected by Yovani Senkubuge from leaf axils of the screw pine (*Pandanus chiliocarpus*) in Bwamba, Toro District, Uganda, 1948. The holotype, allotype and 6 paratypes are in the British Museum.

*Uranotaenia ornata* var. *musarum* Edwards.

A long series of this mosquito was bred out from larvae collected at the same time as those of *U. yovani* sp. n. from *Pandanus* axils in Bwamba.

On examination they were found to vary slightly from the description of the adult given by Edwards (1941) as follows : Vertex sometimes entirely covered with black scales, yellow scales being confined to small lateral patches only, but sometimes (more especially in the male) the yellow scales extend upwards, leaving only a small patch of dark scales in the middle of vertex ; tori sometimes dark brown or blackish ; abdomen with the basal bands on tergites sometimes very narrow or incomplete ; the style assumes various shapes as it is rotated, sometimes appearing long, narrow, and sinuous or shorter and straight.

The larva differs slightly from the description given by Hopkins (1936) as follows :

Head-seta A with 2–5 branches ; comb sometimes with fewer spines (13–16) ; subventral tuft sometimes with 4 branches ; thorax and abdomen with a few stellate setae and the propleural group of hairs like those of *U. yovani* sp. n.

*Pupa*.—Very like that of *U. ornata* Theobald s.str. described by Edwards (1941), no definite distinguishing character was found, and very like that of *U. yovani* sp. n. described above. Differs from *U. yovani* as follows : Scutal integument dark on posterior half ; thoracic hair 8 single and other thoracic hairs with fewer branches. Integument of tergite II all dark and III–V with dark median lines ; all abdominal hairs shorter and with fewer branches ; hair 3 of tergite II usually bifid, but sometimes with 3–5 branches, some of which are bifid distally ; hair 2 and 3 of tergite III single, 3 a thick spine, sometimes notched at tip ; hair 2 and 5 of tergites IV–VII single and short ; hair 8 of tergite VIII usually 2-branched, but may have as many as five.

Series consists of pupal paedotype with associated larval pelt and adult and 41 adults with larval and pupal pelts. The pupal paedotype and 13 other specimens with associated pelts are in the British Museum.

## Summary.

1. *Aëdes* (*Stegomyia*) *heischi* from Kenya, *Culex* (*Culiciomyia*) *mongiro*, *C.* (*C.*) *pseudopruina*, *C.* (*Neoculex*) *kanyamwerima*, *C.* (*N.*) *kilara* and *Uranotaenia yovani* from Uganda are described as new.

2. Notes are given on *Uranotaenia ornata* var. *musarum* Edwards and on its larva, and the pupa is described for the first time.

## Acknowledgments.

I wish to thank Mr. Mattingly of the British Museum (Natural History), London, for much helpful advice, and Dr. De Meillon, of the South African Institute for Medical Research, Johannesburg, for the loan of specimens of *A. deboeri* subsp. *demeilloni*.

## References.

Edwards, F. W., 1941, *Mosquitoes of the Ethiopian Region* **3**.

Hopkins, G. H. E., 1936, *ibid.* **1**.

Knight, K. L., and Chamberlain, R. W., 1948, A New Nomenclature for the Chaetotaxy of the Mosquito Pupa, based on a Comparative Study of the Genera (Diptera : Culicidae). *Proc. Helminth. Soc. Wash.* **15** : No. 11.

# THE USE OF THE PROSTERNUM IN CLASSIFYING ASILIDAE (DIPTERA).

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In the Asilidae there is considerable variation in the structure of the prosternum. In some species, said by Hardy to be primitive, the prosternum is complete (fig. 2), but in many species a greater or lesser part of the prosternum has become membranous. In its least developed state this formation of membrane shows as a slight lateral emargination of the prosternum. Stages of increasing emargination occur until the prosternum becomes divided, on each side, into two portions joined by a bridge (fig. 1); the two portions finally become separated altogether with a membranous area between them (fig. 3). The prosternum is now in three parts; a median sclerite is bounded on each side by membrane which separates it from two small, dorsal sclerites which adjoin the pronotum. Malloch (1928*a*) used the nature of the prosternum to separate the Laphriinae from the Dasypogoninae. This character has also been used by Hardy (1928) and in subsequent papers in distinguishing tribes, and by Pritchard. Hardy (1948) extended his tribal grouping of Australian Asilidae to the genera of the world. He distinguished the tribes largely by the form of their prosterna, combined with certain characters of the terminalia.

An opportunity occurred to examine the Asilidae in the collections of the British Museum (Natural History), and an attempt was made to check the validity of Hardy's use of the nature of the prosternum in grouping the world's genera. Occasionally it was found difficult to distinguish change in shape of the prosternum from true emargination resulting from increase in the area of membrane. In such cases the prosternum was not considered to be emarginated unless part of the prosternum was consistently replaced by a fold of membrane. Where necessary the heads of the insects were removed to facilitate examination, and the doubtful specimens were boiled in potash and dissected.

Examination showed that in several tribes more variation occurs than Hardy described, but that, except for a few anomalous genera, the basis of his classification is valid in regard to the prosternum. Subsequently, Carrera's (1949) revision of certain neotropical Dasypogoninae became available to the author, and it was found that a new tribe, the Megapodini, had been formed in which some of these anomalous genera are brought together. The results of the examination are briefly described below, based on the tribes used by Hardy (1948) and incorporating the Megapodini.

(1) Hardy (1948) erected the tribe Xenomyzini for the genera associated in a group by Pritchard (1938), including *Xenomyza* Wied. (= *Damalis* F.[1]), *Holocephala* Jaenn., *Rhipidocephala* Herm. and other genera. Hardy defined the tribe as "genera of Dasypogoninae that have the prosternum in process of breaking down towards an isolated ventral plate without processes." In his key to tribes he described the prosternum of the Xenomyzini as "varying from slightly emarginate along the anterior and posterior edges to the

[1] Hardy (1942).

emargination meeting so as to form a finger-like process arising from the ventral part, in which latter case the isolated lateral portions of the prosternum become fused to the pronotum." In the species of Xenomyzini examined the prosternum varied from complete, that is without membrane, e.g., *Holocephala nitida* Wied., to distinctly emarginated. The condition, described by Hardy, in which a finger-like process arises from the ventral part was not seen, but not all genera were available for examination. As will be shown later, other DASYPOGONINAE show similar degrees of emargination of the prosternum, so this cannot be used as a diagnostic character to distinguish the Xenomyzini.

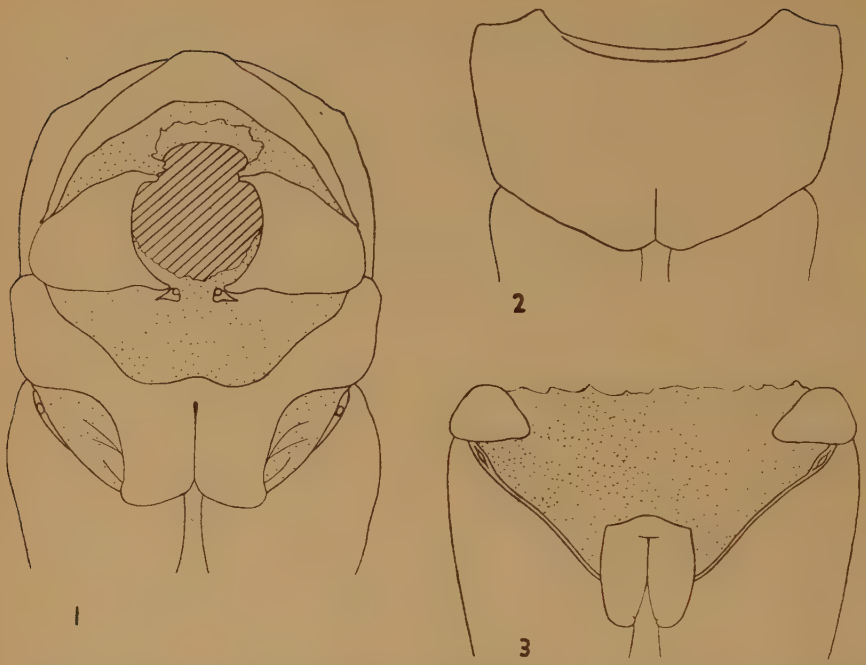
Pritchard (1941), referring to this group of genera, stated, "This relationship is indicated principally by the well-developed prosternum, which appears to extend to the pronotum in the form of a rather narrow bridge." The narrow bridge joining the body of the prosternum to the pronotum was present in all of the Xenomyzini examined (fig. 4), but a similar structure was found in a number of other Dasypogoninae with well developed prosterna, e.g., *Perasis transvaalensis* Ric. (Laphystiini) (fig. 5), so this character, too, cannot be used diagnostically.

(2) Under the description "Prosternum contiguous with the pronotum and in no way reduced," Hardy places the tribes Stichopogonini, Laphystiini, Atomosiini and Laphriini. This group of tribes is also characterized by the absence of tibial spurs. The prosternum was complete in all the Stichopogonini examined except *Cryptopogon vernaculus* White, which shows the beginnings of emargination, and *Lasiopogon* Loew, where the prosternum is distinctly emarginated. It is interesting that *Lasiopogon* differs considerably in chaetotaxy from other Stichopogonini. In the Laphystiini (= Prytaniinae) most genera were found to have a complete prosternum, but slight emargination occurs in *Laphystia argenteofasciata* Eng., *L. gigantella* Loew, *Triclis argentifacies* Will. and *Perasis transvaalensis* Ric.

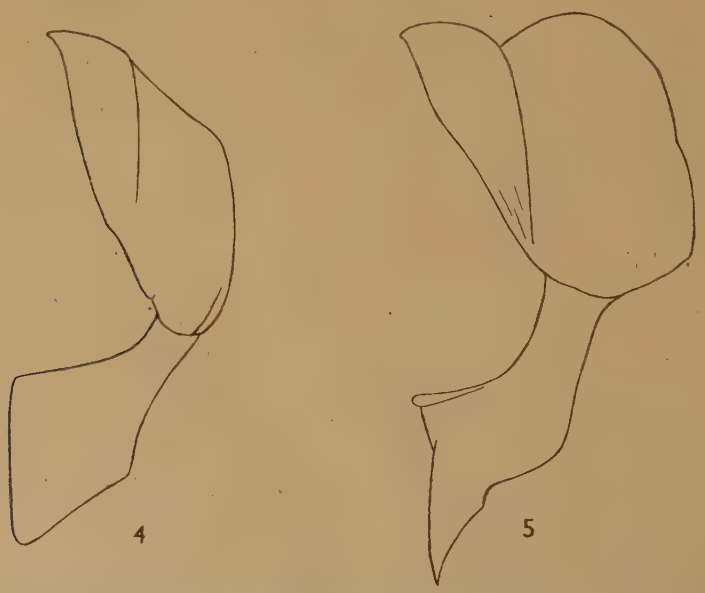
The prosternum appears to be complete throughout the Atomosiini. In the Laphriini there was frequently variation within genera from complete to slightly emarginated. For example, the prosternum of *Laphria auricorpus* Hobby is complete, but that of *L. vultur* O. S. slightly emarginated, and the prosternum of *Maira paradisiaca* Wk. is complete, while that of *M. woolastoni* Aust. is slightly emarginated. The prosternum of *Hyperechia bifasciata* Grünb. is distinctly emarginated.

(3) Under the description "Prosternum completely reduced so as to leave the ventral part isolated broadly by membrane and without the finger-like projection," Hardy placed the Saropogonini, Dasypogonini, Chrysopogonini, Phellini and *Brachyrrhopala* Macq. The Megapodini also fall under this description. In this section of the DASYPOGONINAE tibial spurs are present in most genera, though absent in a few. All of these groups were examined except *Brachyrrhopala*, and Hardy's description was found to hold good for all genera examined except *Blepharepium* in the Saropogonini. *Blepharepium coarctata* Perty, *B. cayennensis* Fabr. and *B. subcontractus* Wk. were examined, and in all of them the prosternum was much emarginated but not divided. Tibial spurs are present in all three species.

(4) Among the ASILINAE the extreme conditions were found in related species. In the Leptogastrini the prosternum was found in two conditions, either complete or widely divided. Both conditions were found in *Leptogaster*




FIGS. 1–3.—(1) Anterior view of prothorax and cervical sclerites of *Ommatius angustiventris* Macq.; (2) Prosternum of *Stichopogon punctum* Lw.; (3) Prosternum of *Neolaparus pedunculatus* Lw.




FIGS. 4–5.—Lateral views of prosterna. (4) *Xenomyza pallinota* Herm.; (5) *Perasis transvaalensis* Ric.

Mg. and in *Lagynogaster* Herm. *Lasiocnemus violacea* Herm. was alone, among the species observed with undivided prosternum, in showing the beginnings of emargination. The genera of the Asilini fall into three groups; firstly, those genera in which the prosternum is always distinctly emarginated, e.g., *Machimus* Loew and *Philonicus* Loew; secondly, those genera in which the prosternum is always widely divided, e.g., *Erax* Scop. and *Philodicus* Loew; and thirdly, those genera in which both these conditions prevail, e.g., *Cerdistus* Loew and *Asilus* L. In the Ommatiini the prosternum is frequently found in a state of transition. The prosternum is never complete, but is sometimes much emarginated as in *Emphysomera femorata* Big., occasionally narrowly divided as in *Ommatius parvus* Big., and sometimes widely divided as in *O. chinensis* F. and *Allocotosia aurata* F.

## Discussion.

The extent of the variation in the form of the prosternum must prevent the use of this structure as a diagnostic character. The tribes of the Dasypogoninae can be grouped according to whether the prosternum varies from complete to much emarginated or just divided (some Xenomyzini), or is widely divided, but beyond this further diagnosis is impossible. For example, the Xenomyzini cannot be separated from the Stichopogonini on the basis of the prosternum, since both contain species with complete prosterna; neither can the Xenomyzini be separated from the Laphystiini by means of the prosternum, both contain species with slightly emarginated prosterna. Similarly, this character cannot be used to distinguish the Ommatiini from the Asilini or Leptogastrini. On present tribal groupings the form of the prosternum cannot be used as a diagnostic character, nor, in its strict sense, as a supplementary character. However, it may well prove useful in indicating the probable affinities of a genus.

At this point it might be useful to consider whether the form of the prosternum gives any indication of the course of evolution within the Asilidae. In the Asilinae insufficient appears to be known of the relationships of the genera to draw any conclusions. However, those genera of the Asilini and Leptogastrini in which both complete and divided prosterna occur might usefully be re-examined to see whether they are composite or not. Within the Dasypogoninae relationships are more apparent. Hardy (1934) suggested that the Dasypogoninae could be divided into two sections on the form of the prosternum. The later work of Hardy (1948) and Carrera (1949) confirmed this division, but suggested that the Xenomyzini fitted into neither section. At present the Dasypogoninae can be divided into three sections. The first section contains those tribes in which the prosternum is complete in most species, but is occasionally slightly emarginated and in which a tibial spur is never present; it consists of the Stichopogonini, Laphystiini, Atomosiini and Laphriini. The second section consists of the Xenomyzini, where the prosternum varies from complete to just divided with a finger-like process extending from the lower sclerite and in which tibial spurs are never present. The third section contains those Dasypogoninae in which the prosternum is invariably widely divided (except *Blepharepium* of the Saropogonini) and in which a tibial spur is present in most genera, but is absent in a few; it consists of the Saropogonini, Megapodini, Dasypogonini, Phellini, Chrysopogonini and

*Brachyrrhopala*. These three sections appear to represent three distinct lines of development within the DASYPOGONINAE. The group of tribes with the complete or slightly emarginated prosternum and without a tibial spur appears to be primitive and the other two groups probably represent later developments, but on the nature of the prosternum and the presence or absence of tibial spurs alone it is impossible to draw further conclusions about their interrelationships.

## SUMMARY.

Variation occurs in the structure of the prosternum in the ASILIDAE, and this has been used in classifying the family.

Examination of the prosternum in all groups showed that too much variation occurs for it to be used as a diagnostic or supplementary character.

Evolution within the ASILIDAE is discussed in the light of present knowledge.

## ACKNOWLEDGMENTS.

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## REFERENCES.

CARRERA, M., 1949, Contribuição ao conhecimento dos Asilidae Neotropicais (Diptera). *Arqu. Zool. Estado São Paulo* **7** : 1–148.

HARDY, G. H., 1928, Third contribution towards a new classification of Australian Asilidae. *Proc. Linn. Soc. N.S.W.* **53** : 470.

——, 1934–35, The Asilidae of Australia. Parts I–IV. *Ann. Mag. nat. Hist.* (10) **13** : 498–525 ; **14** : 1–35 ; **16** : 161–187, 405–426.

——, 1942, Miscellaneous notes on Australian Diptera. IX. *Proc. Linn. Soc. N.S.W.* **67** : 197–204.

——, 1948, On classifying Asilidae. *Ent. mon. Mag.* **84** : 116–119.

MALLOCH, J. R., 1928*a*, Notes on Australian Diptera, No. xiv. *Proc. Linn. Soc. N.S.W.* **53** : 297.

——, 1928*b*, Notes on Australian Diptera, No. xvii. *Ibid.* **53** : 608.

PRITCHARD, A. E., 1938, Synopsis of north and central American *Holcocephala* with a description of a new species (Diptera : Asilidae). *J. N.Y. ent. Soc.* **46** : 11–21.

——, 1941, The genus *Haplopogon* in the New World, with the description of *Erinus* n. sp. (Diptera : Asilidae). *Ann. ent. Soc. Amer.* **34** : 350–354.

# STUDIES ON THE CHAETOTAXY OF LARVAE OF *PLUSIA* SPECIES (LEPIDOPTERA : PHALAENIDAE).

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## 1. Introduction.

Among the insects which cause appreciable amounts of damage to agricultural products the order Lepidoptera is one of the most important. Most of the species concerned cause damage during their active larval stage, except in the case of fruit-sucking moths, where the adults also are injurious. Thus, in order to adopt adequate control measures against a particular insect pest it is essential that it should be correctly identified in all the recognizable stages of its life-history and, more especially, the larval stages.

Most of the literature on the immature stages of Lepidoptera, except the recent contributions of Gardner (1938–1948), Janse (1938), Hinton (1946) and a few others, is based on the colour and size of the insect concerned. The colour, in fact, is no guide to correct systematic identification, as it changes according to the environmental conditions and the feeding habits. It is also known to suffer changes when the insects are preserved in alcohol or in some other preservative, and even when mounted dry. It is, therefore, evident that any character used for the classification of the immature forms should be such that it remains fairly constant under different environmental conditions and also retains the characteristic features even after the specimens have been preserved for a considerable period in a standard preservative.

The importance of chaetotaxy in correct identification of the immature stages was recognized as early as the later part of the nineteenth century and, since that time, a number of contributions have been made. Various workers on immature stages of a number of families, genera, and species in different parts of the world have established the feasibility of using chaetotaxy in the setal distribution on the body as a true classificatory factor ; and among these pioneer workers were Dyar (1894–1901), Forbes (1910–1916), Fracker (1915), Gardner (1938–1948), Hinton (1946), etc. Chappel (1934), on the other hand, is of the opinion that chaetotaxy cannot possibly be used with any fair degree of accuracy in taxonomy. However, the overwhelming evidence which has already accumulated indicates that chaetotaxy does play a definite role in the correct identification of most of the species.

Very little work on this line has been attempted in India except the commendable work of Gardner (1938–1948). Some attempt, however, was also made by Isaac and Rao (1941) in classifying the immature stages of lepidopterous sugarcane borers, but since the setal arrangements have only been figured and not individually homologized, it cannot be taken as scientifically adequate. As the chaetotaxy of the larvae of *Plusia* species has not until now been studied in detail, it was thought worth while to fill this gap. This investigation was therefore undertaken, and an attempt made to identify and homologize the different series of setae, following the nomenclature of Dyar and Forbes.

[1] The work formed a Thesis for Associateship of the Indian Agricultural Research Institute, New Delhi, of the Junior Author and was conducted under the guidance of the Senior Author.

## 2. Material and Technique.

The material is represented by three species of the genus *Plusia*, viz. *P. orichalcea* Fabricius, *P. nigrisigna* Walker and *P. ni* Hübner, which are common in Delhi. Larvae were collected from the fields on lucerne, berseem, cabbage, cauliflower, tomato, potato, grain and peas, and were reared to the adult stage under laboratory conditions. When adults emerged, both males and females of the same species were kept together in glass chimneys with sufficient food material and some green leaves for egg-laying purposes. The males exceeded the females in order to ensure fertilization. Eggs were laid on the green leaves and then removed. After hatching the young larvae were reared to the adult stage. From the second series a number of larvae of each stage were preserved and used for the present work. This was repeated with each of the three species.

For preservation the larvae were either killed in 70 per cent. alcohol and preserved, or killed in boiling water and then preserved in 70 per cent. alcohol. The latter method was found to be preferable, as the larvae died in a more extended condition.

The preserved specimen was transferred from alcohol to water and the head was carefully removed with a fine needle under a binocular microscope, care being taken that no seta either of the head or the prothorax was removed or damaged. The body of the larva was next cut open from the middle on the ventral side along the midventral line, and then segment-wise at every segment, except the 9th and the 10th abdominal segments, which are closely apposed. Every segment was kept in a separate marked tube in 10 per cent. KOH solution for about two hours. During this period the body tissues (except chitin) were either dissolved or rendered so soft that there was no difficulty in removing them with a pair of fine forceps without damaging the cuticle. The material was then washed in distilled water, stained with acid fuchsin, dehydrated and mounted in canada balsam.

## 3. Description of Species.

### (i) *Plusia orichalcea* Fabricius (Plate 1).

*Head* (figs. 1 and 2).—As a whole globular in shape, slightly wider than high, each epicranium bearing eleven setae and six ocelli. Seta *i* on the top level with the top of the epicranial suture and situated further away from the suture than *ii*, which is near the top of the frons ; *iii* on centre of epicranial lobe above level of *ii* and below *i*, being nearer to *i* than *ii* ; *iv* in front of ocelli, in the level of the sixth ocellus and near to it ; *v* behind sixth ocellus, in the level of *iv* and equidistant from *iv* and *xi* ; *vi* behind the ocelli as a whole, near the antenna and slightly above the level of the second ocellus ; *vii* within the circle of the ocelli in the level of the fourth and first ocelli, and equidistant from each of them ; *viii* in front of ocelli, slightly above level of fourth ocellus and equidistant from *ix* and *iv* ; *ix* situated just near base of antenna on corner towards clypeus ; *x* behind ocelli, above the level of *vi* and below *vii* ; *xi* also situated behind ocelli, in the level of sixth ocellus and that of *iv*, making a slight angle with *iv* and *v*.

In addition to these setae, which are very well developed, there are a number of punctures : Puncture (*i*) is situated between *i* and *ii*, is above the level of *iv* and *ii* ; (*iii*) very near to *iii* towards the occiput and making a straight line with *iii* and (*ii*) ; (*iv*) situated between *viii* and *iv*, nearer to *viii* but not in a straight line with *viii* and *iii* ; (*xi*) is just near *xi* and the occipital margin. Very close to (*Xi*) there is a microscopic seta, not previously recorded in any other species, and we name it as *A*.

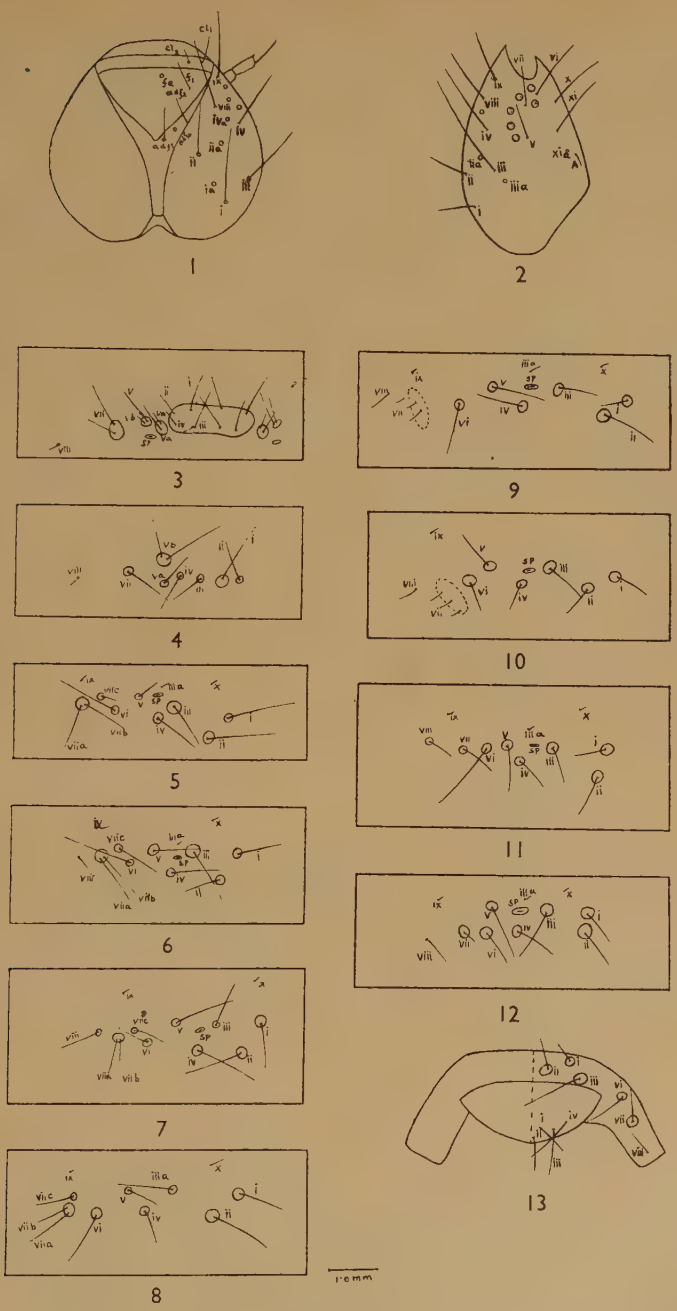



PLATE 1.

*Plusia orichalcea* Fabricius. (Arrangement of setae and punctures).

(1) Dorsal view of head. × 21. (2) Lateral view of epicranium. × 21. (3) Prothorax. × 5. (4) Meso- and metathoraces. × 5. (5–12) Abdominal segments I–VIII. × 5. (13) Abdominal segments IX–X. × 5.

The frons bears only one pair of setae, *fr. i*, and a pair of punctures (*fr. o*), which are very close to each other, just near to the outer edge of the frons. *fr.i*, slightly above the level of *ix* and slightly angular to *Adf. i* and *ii*. The adfrontal area bears two pairs of setae, viz. *Adf. i*, which is just above the top of the frons, and *Adf. ii*, which is in the level of *iv*, making an angle with *iv* and *viii*. There is also a pair of punctures (*Adf. o*)which is equidistant from *Adf. i* and *Adf. ii*.

*Thorax.—Prothorax* (fig. 3): Cervical shield well developed and bearing four pairs of setae which are arranged in double rows. Anterior row on margin of shield contains setae *i* and *ii*, while the posterior one bears *iii* and *iv*. Both *iii* and *iv* are at a slightly higher level than *i* and *ii* respectively. *Va* is bisetose and borne on the same tubercle above the level of the spiracle, anterior to it and just ventral to *iv*; *v* and *vi* also on a single tubercle, which is directly anterior and close to the spiracle. *vii* is bisetose and equidistant from the spiracle and base of the leg.

*Meso- and metathorax* (fig. 4): Setae identical in positions both on meso- and metathoraces; *i*, *ii* and *iii* all in a straight line and equidistant from one another; *iv* smallest and placed on a dark tubercle; *va* moderately developed and directly caudal of *v* and *vb*, which are borne by one tubercle; *vii* unisetose and in a line with *i*, *ii* and *iii*, while *viii* (Forbes) is small and occupies the usual place.

*Abdomen.—First eight abdominal segments* (figs. 5–12): Setae *i*, *ii* and *iii* above the level of the spiracle, while *iv* is posterior to and in a level with or ventrad of the spiracle. Below the spiracle and above the base of the leg or in that level in the legless segments are setae *v* and *vi*, the latter being unisetose. Seta *vii* trisetose in the first six segments, *viia* and *viib* being on the same tubercle and *viic* on separate ones in the 1st to 4th segments, but all three being separate in 5th and 6th segments, but unisetose on 7th and 8th segments. In the 4th segment *viic* situated very close to *viia* and *viib*; *viii* comparatively smaller in size and situated on inner side of leg in the leg bearing segments or near the mid-ventral line in others.

In addition to these very well developed setae there are three microscopic setae, viz. *iiia* (Forbes), *vii* and *x* (Forbes); *iiia* is anterior and very close to the spiracle, *vii* is anterior to *vi* (Dyar, 1901) and near the anterior margin of the segment; *x* is situated near the anterior margin of the segment just anterior to *ii*.

*Ninth and tenth segments* (fig. 13).—Ninth segment devoid of spiracle and bears only six pairs of setae. *i*, *ii* and *iii* situated as in first eight segments, *iv* and *v* not traceable; *vi* and *vii* both unisetose, forming a straight line with *viii*, which is near the mid-ventral line and, as usual, comparatively small in size. Tenth segment aborted on lateral sides and bears only four pairs of setae, viz. *i*, *ii*, *iii* and *iv*; *i* near mid-dorsal line and very near posterior margin; *ii* at a slightly higher level than *i* and just on posterior margin of segment; *iii* placed on posterior margin of segment, below level of *i* and nearly equidistant from *i* and *ii*, while *iv* is situated near posterior margin of segment, anteriormost in position and placed twice as far away from *iii* as *iii* is from *i*.

## (2) *Plusia nigrisigna* Walker (Plate 2).

*Head* (figs. 1 and 2).—As in the case of *Plusia orichalcea*. This species bears eleven pairs of setae and six ocelli. Setae *i* and *ii* in same positions as in that species; *iii* on centre of lobe in level of *ii* and slightly nearer to *ii* than *i*; *iv* as in *P. orichalcea*; *v* behind ocelli in the level of *iv* and slightly nearer to *iv* than *xi*; *vi* and *vii* occupy the same positions as in *P. orichalcea*; *viii* before the ocelli, in the level of 4th ocellus and nearer to *ix* than *iv*; *ix* and *x* are placed at the same positions as in *P. orichalcea*, while *xi* is behind the ocelli in the level of the sixth ocellus and makes a straight line with *iv* and *v*. *A* also occupies the same position as in *P. orichalcea*.

Puncture (*i*) between *i* and *ii*, nearer to *ii* than *i*; (*ii*) above the level of *iv* and below *ii*, making a straight line with (*i*) and (*iv*), and nearer to *ii* than *iv*; (*iv*) between *iv* and

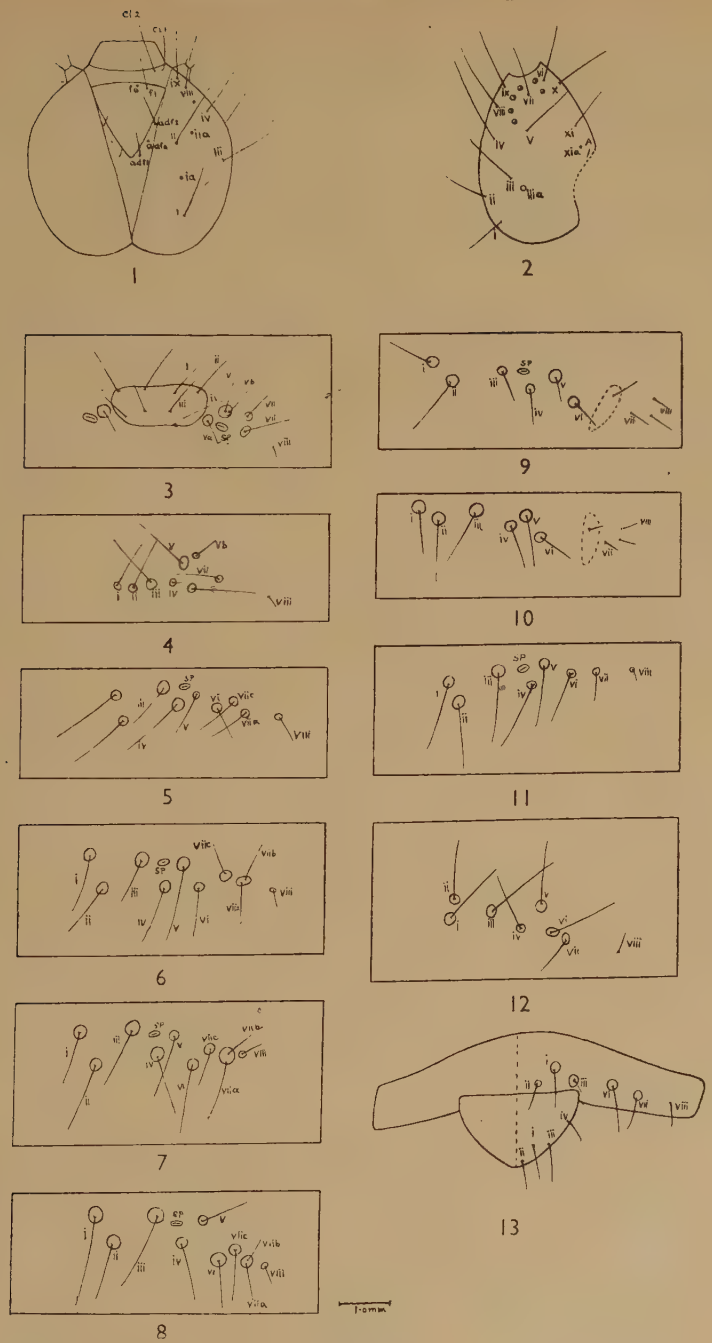


PLATE 2.

*Plusia nigrisigna* Walker. (Arrangement of setae and punctures).

(1) Dorsal view of head × 21. (2) Lateral view of head. × 21. (3) Prothorax. × 5. (4) Meso- and metathoraces. × 5. (5–12) Abdominal segments I–VIII. × 5. (13) Abdominal segments IX–X × 5.

*viii*, equidistant from both, in a straight line with *viii* and *iii*, and at the same time with (*i*) and (*ii*), while (*iii*) and (*xi*) occupy the same positions as in *P. orichalcea*.

Setae of frons and adfrontal areas, and punctures of adfrontal area in the same positions as in *P. orichalcea*.

*Thorax.—Prothorax* (fig. 3): Setae *i*, *ii*, *iii* and *iv* placed as in *P. orichalcea*, *va* above level of spiracle, anterior to it and ventral but ectad to *iv*; *va* is, however, wanting in the segment; *V* and *vb* borne on a single tubercle directly anterior and close to the spiracle; *Vii*, although bisetose, as in *P. orichalcea*, is represented by two setae borne on two separate tubercles somewhat apposed.

*Meso-* and *metathorax* (fig. 4): As in the preceding species, the setae are identical in both the segments; *i*, *ii*, *iii*, *iv* and *va* occupy the same positions as in the *P. orichalcea*; *v* and *vb* are, however, situated on separate tubercles, closely apposed, *v* directly anterior to *va* and *vb*, is situated somewhat ventrad of *v*; *vii* and *viii* are situated at the same positions as in *P. orichalcea*.

*Abdomen.—First eight adbominal segments* (figs. 5–12): General plan and distribution of setae as in *P. orichalcea* with little, if any difference, except that in the 1st segment *vii* is bisetose, *viib* is wanting, and in the 4th segment *viic* is separate and somewhat away from *viia* and *viib*, both borne on the same tubercle, while it is closer to *viia* and *viib* in *P. orichalcea*.

*Ninth and tenth abdominal segments* (fig. 13): As in *P. orichalcea*, the 9th segment bears only six pairs of setae, *iv* and *v* being absent; *i*, *ii* and *iii* occupy same positions as in other segments, but *iii* more or less weakly developed; *vi* and *vii* unisetose and fall almost in a straight line with *viii*; *viii* near mid-ventral line and, as usual, smaller in size. Tenth segment bears only four pairs of setae, which in their positions and relations to each other are almost identical to those of the 10th segment of *P. orichalcea*.

## (3) *Plusia ni* Hübner (Plate 3).

*Head* (figs. 1 and 2).—With the usual eleven pairs of setae: *i* being at same position as in *P. orichalcea*; *ii* in level of *iii* and much above top of the frons; *iii* centre of epicranial lobe; *iv* placed before ocelli above level of 5th ocellus; *v* behind ocelli, and situated near and above 6th ocellus, nearly equidistant from *iv* and *xi*; *vi* and *vii* occupy the same positions as in *P. orichalcea*; *viii* in front of ocelli, in level of and close to 4th ocellus, being nearer to *iv* than *ix*. Setae *ix*, *xi* and *A* at the same positions as in *P. orichalcea*, while *x* is behind ocelli as a whole and below level of *vi*.

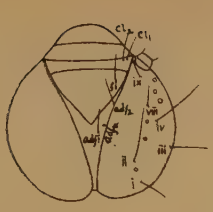
As in the two species already described, there are also five punctures on the epicranium; (*i*) is situated between *i* and *ii*, practically equidistant from both; (*ii*) in a line with (*i*) and (*iv*), nearer to (*iv*) than (*i*), and at the same time it also falls in a line with *ii* and *iv*; (*iii*) at its usual place; (*iv*) between *viii* and *iv*, practically equidistant from both and making a straight line with *viii* and *iii*; (*xi*) occupies the same position as in *P. orichalcea*.

Setae and punctures of frons and adfrontal areas in their positions are identical to those of the same region of *P. orichalcea*.

*Thorax.—Prothorax* (fig. 3): Cervical shield slightly curved on lateral sides and, as in the other two species, bears four pairs of setae: *i*, *ii*, *iii* and *iv* occupy the same positions as in *P. orichalcea*. The bisetose *va* is borne on the same tubercle, which is situated above the level of the spiracle, near the curvature of the cervical shield and just ectad to *iv*, *v*, *vb*, *vii* and *viii*. They are at the same positions as in *P. orichalcea*, *vii* being bisetose.

*Meso- and metathorax* (fig. 4): As in the previous two species the setae are identical in both the segments and all the setae bear the same positions and relations to one another as those of the respective segments in *P. orichalcea*,

*Abdomen.—First eight segments* (figs. 5–12): The positions and general relations of the setae to one another are the same in all the segments as in *P. orichalcea*, except in the case of *vii* which differs in the 1st, 2nd and 4th segments. In the 1st segment *vii*, instead of being trisetose, is bisetose—*viia* and *viic* being borne on separate tubercles, while *viib* is not traceable. In the 2nd segment *vii* is trisetose, but all three setae are situated on sepa-



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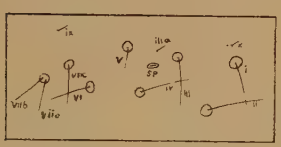

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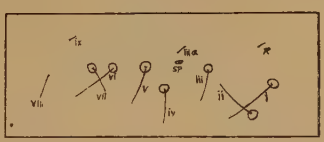

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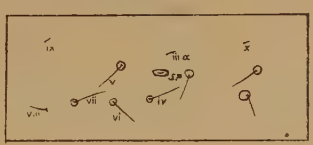

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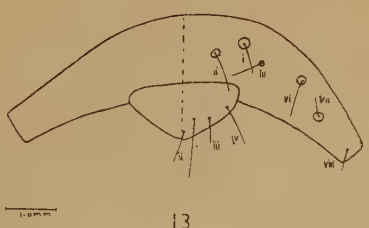

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PLATE 3.

*Plusia ni* Hübner. (Arrangement of setae and punctures).

(1) Dorsal view of head. × 21. (2) Lateral view of head. × 21. (3) Prothorax. × 5. (4) Meso- and metathoraces. × 5. (5–12) Abdominal segments. I–VIII × 5. (13) Abdominal segments IX–X. × 5.

rate tubercles. In the 4th segment *vii* is bisetose and *viib* wanting.

*Ninth and tenth segments* (fig. 13): As usual, the 9th segment bears only six pairs of setae: *i*, *ii* and *iii* maintain the same positions as in *P. orichalcea*, but *iii* appears weakly developed and comparatively smaller in size; *vi* in a line with *vii* and *Viii* and placed as far from *vii* as *vii* is from *viii*; *vii* and *viii* occupy the same positions as in *P. orichalcea*. Tenth segment bears only four pairs of setae, identical in positions and relations to one another as to those of the 10th segment in *P. orichalcea*.

The main points of difference in the chaetotaxy and distribution of punctures occurring in the three species are given in Table 1.

TABLE 1.

Table showing main points of difference in chaetotaxy of *Plusia* species. Plates 1–3.

| Region. | *P. orichalcea* Fab. | *P. nigrisigna* Wlk. | *P. ni* Hübn. |
|---|---|---|---|
| HEAD: | | | |
| *ii* . . . | Below the level of *iii* and near the top of frons | Below the level of *iii* and near the top of frons | Below the level of *iii* and much above the top of frons |
| *IV* . . . | Not in line with *viii* and *iii* | Almost in a line with *viii* and *iii* | In a line with *viii* and *iii* |
| *V* . . . | Equidistant from *iv* and *xi*; the three points making an obtuse angle | Slightly nearer to *iv* than *xi*; the three points almost in a a straight line | Equidistant from *iv* and *xi*; the obtuse angle made by the three points less than *P. orichalcea* |
| *viii* . . . | Equidistant from *iv* and *ix*. The three points making an angle at *viii* | Nearer to *ix* than *iv*. The three points almost in a straight line | Nearer to *iv* than *ix*. The three points almost in a straight line |
| THORAX: | | | |
| *Prothorax, va* . | Bisetose on the same tubercle | One of the pair absent | As in *P. orichalcea* |
| *vii* . . . | Bisetose, setae on the same tubercle | Bisetose, both setae on separate tubercles | As in *P. orichalcea* |
| *Meso- and meta-thoraces, v–vb* | On the same tubercle | Separate tubercles | As in *P. orichalcea* |
| ABDOMEN: | | | |
| *First segment, vii* | Trisetose, the paired more latero-ectad ones on the same tubercle (*viia*, *vii b*), while the third *viic* on a separate tubercle | Bisetose on separate tubercles (*viia* and *viic*) one above the other, while the second, *viib*, is absent | Bisetose as in *P. nigrisigna* |
| *Second segment, vii* | Trisetose as in the 1st segment | As in *P. orichalcea* | Trisetose; all the three setae on separate tubercles |
| *Fourth segment vii* | As in 2nd segment | As in *P. orichalcea* | Bisetose, *viia* and *viic* on separate tubercles, *viib* being absent |
| *Ninth segment, iii* | Normally developed | Weakly developed | Weakly developed |

## 4. Conclusion.

Workers on the study of the setal arrangement in the immature forms of the order Lepidoptera are divided in their opinions, forming two opposing groups. Workers with extensive experience—like Dyar, Forbes, Fracker, Hinton, etc.—all agree that the system of chaetotaxy is scientifically adequate in its practical application in classifying the order into families and genera from the immature stages. On the other hand, Chappel, who does not agree with this view, concludes that the system of classification based on chaetotaxy of the larvae is unsatisfactory on account of the existence of morphological features common to different families, genera and species, and even in intra-specific variations.

From the work on *Plusia* species, however, it is evident that, as certain differences in setal characters of different regions exist between the three Indian species studied, this factor can be utilized with a fair degree of success in classifying the larvae of the different species of this genus.

We are, however, of opinion that intra-specific morphological variations existing in larvae are also of common occurrence even among the adults collected from various zoogeographical regions, where food and ecological factors play important roles on the life-economy, and consequently on the external morphology of the insects. Such examples of zoogeographical intra-specific imaginal variations do exist in a fair number of cases and sometimes these variations are noticeably more distinct than the intra-specific variations. Further, according to the modern trend of systematics, such intra-specific variations are in the incipient process of full speciation.

As all the regions, viz. head, thorax and abdomen, show differences when compared with the setal distribution of the respective regions in other species, classification can be based on this factor either of one part or preferably of a combination of all the regions of the body.

## 5. Acknowledgments.

We are indebted to Dr. E. S. Narayanan, Head of the Division of Entomology, Indian Agricultural Research Institute, for help during the preparation of this paper. Our special thanks are due to Dr. H. E. Hinton, of Bristol University, for going through the paper and making valuable suggestions.

## Summary.

The importance of chaetotaxy as a factor in correctly establishing the identity of a species, especially in the immature stages, has long been recognized and a number of excellent contributions made in this direction in different parts of the world. In India, Gardner carried out investigations on these lines fairly recently, and a series of publications appeared between the years 1938–1948, wherein the latest mode of identifying the various types of hairs, setae and punctures was adopted by him and their true homologies established. During this period Gardner dealt mostly with the immature stages of the Indian forms belonging to the families Lymantriidae, Noctuidae, Hypsidae, Zygaenidae, etc. Since the members of the *Plusia* group belonging to the family Phalaenidae were not dealt with by Gardner, a detailed chaetotaxy of head, thorax and abdomen of mature larvae of pure strains bred in the

laboratory of three species of *Plusia* occurring in Delhi and its environs, has been worked out with a view to filling the gap.

## References.


Chappel, A. V., 1934, Life histories of some New Zealand Lepidoptera, with notes on the male genitalia and larval chaetotaxy. *Stylops* **3** : 169–177.

Dyar, H. G., 1894, A classification of lepidopterous larvae. *Ann. N.Y. Acad. Sci.* **8** : 194–232, 5 figs.

——, 1895, Additional notes on the classification of lepidopterous larvae. *Trans. N.Y. Acad. Sci.* **14** : 49–62.

——, 1896, Note on the head setae of lepidopterous larvae, with a special reference to the appendages of *Perophora melsheimerii*. *J. N.Y. ent. Soc.* **4** : 92–93, 2 figs.

——, 1901, A century of larval descriptions. *Ent. Rec.* **13** : 37–40.

Forbes, W. T. M., 1910, A structural study of some caterpillars. *Ann. ent. Soc. Amer.* **3** : 94–143, 143 figs.

——, 1916, On certain caterpillar homologies. *J. N.Y. ent. Soc.* **24** : 137–142, 1 fig.

Fracker, S. B., 1915, The classification of lepidopterous larvae. *Illinois biol. Monogr.* **2** : 169 pp., 112 figs.

Gardner, J. C. M., 1938, Immature stages of Indian Lepidoptera—(1) Lymantriidae. *Indian For. Rec.* (n.s.), **3** (1) : 187–217.

——, 1941*a*, Immature stages of Indian Lepidoptera—(2) Noctuidae, Hypsidae. *Ibid.* **6** (8) : 253–296.

——, 1941*b*, Immature stages of Indian Lepidoptera—(3). *Ibid.* **6** (9) : 299–314.

——, 1942, Immature stages of Indian Lepidoptera—(4) Zygaenidae. *Ibid.* **7** (4) : 155–162.

——, 1945, Immature stage of Indian Lepidoptera—(5). *Indian J. Ent.* **5** : 89–102.

——, 1948, On larvae of the Noctuidae (Lepidoptera) IV. *Trans. R. ent. Soc. Lond.* **99** : 291–318, 3 figs.

Gerasimov, A. M., 1935, Zur Frage der Homodynamie der Boreten von Schmetterlings paupen. *Zool. Anz., Leipzig* **112** : 177–194, 8 figs.

Hinton, H. E., 1946, On the homology and nomenclature of the setae of lepidopterous larvae with some notes on the phylogeny of the Lepidoptera. *Trans. R. ent. Soc. Lond.* **97** : 1–37, 24 figs.

Isaac, P. V., and Rao, K. V., 1941, A key for the identification of known lepidopterous borers of sugarcane in India based on morphological characters. *Indian J. agric. Sci.* **11** : 795–803.

Janse, A. J. T., 1938, On the structure of lepidopterous larvae, with special reference to the mature larva of *Leto venus* Stoll. *J. ent. Soc. S. Africa* **2** : 165–175.

# FURTHER RECORDS OF EAST AFRICAN TERMITES.

By W. Victor Harris, F.R.E.S.

## Kalotermitidae.

### *Cryptotermes dudleyi* Banks.

*Cryptotermes dudleyi* Banks, 1918, *Bull. Amer. Mus. nat. Hist.* **38** : 659–667. (Panama.)

Tanganyika : Tanga, 1937, No. 325 ; in stored Podocarpus timber.

We are indebted to Dr. A. E. Emerson for the identification of these specimens, which appear to be the first from Africa. It is a species widely distributed in Central America and the Far East. The appearance of exotic Kalotermitids at African seaports is a matter of considerable economic interest, as the indigenous dry-wood termites are not as a rule conspicuously destructive. The Tanga specimens were found in timber of local origin, and the presumption is that infestation took place in the store. Further damage to timber there has not been reported, however.

### *Cryptotermes havilandi* (Sjöstedt).

*Calotermes domesticus* Sjöstedt, 1897, *Ent. Tidskr.* **18** : 212. (Fernando Po, Cameroons.)
*Cryptotermes havilandi* Sjöstedt, 1926, *K. svenska Vetensk. Akad. Handl.* **3** : 29. (Mombasa.)

Tanganyika : Dar es Salaam, 1943, No. 437 ; in ceiling of dwelling house.

A number of buildings in Dar es Salaam, all built prior to 1914, are known to be infested with this dry-wood termite. Soft-wood ceilings and window frames are damaged. In one case this termite was found boring in soft-wood supports inside a piano. It is possible that much of the damage done is obscured by that of the much more active *Coptotermes amanii*. This species is recorded by Sjöstedt from Mombasa.

## Termitidae.

### *Odontotermes rectanguloides* Sjöstedt.

*Odontotermes rectanguloides* Sjöstedt, 1924, *Rev. zool. Afr.* **12** : 490. (Belgian Congo.)
*Odontotermes rectanguloides* Harris, 1948, *Proc. R. ent. Soc. Lond.* (B) **17** : 78. (Uganda.)

Tanganyika : Iringa, 1937, No. 226 ; cutting grass.

This extends the known range of this termite considerably eastward. In the Southern Highlands of Tanganyika its habit of cutting dry grass and collecting vegetable debris is as has already been noted in Uganda.

### *Synacanthotermes zanzibarensis* (Sjöstedt).

*Termes* (*Synacanthotermes*) *zanzibarensis* Sjöstedt, 1915, *Voyage Allaud et Jeannel*, Termitidae : 10. (Zanzibar.)

Zanzibar : 1937, No. 231 ; making earth tunnels on clove trunks used for building.

Kenya : Oldonyo Sapuk, 1950, No. 628 ; in stump of dead shrub.

The finding of this termite in the Kenya Highlands, 35 miles north-east of Nairobi, suggests a wide ecological range. Hitherto known only from Zanzibar Island, it may now be expected from many parts of East Africa.

### *Ancistrotermes latinotus* (Holmgren).

*Termes crucifer* Sjöstedt, 1900, *K. svenska Vetensk. Akad. Handl.* **34** : 69. (Angola.)
*Microtermes latinotus* Holmgren, 1912, *ibid.* **48** : 42. (Luapula.)

Uganda : Butiaba, 1946, No. 465 ; from earth tunnels on dead shrub. Busia, 1950, No. 598 ; from a *Cubitermes* mound.

Tanganyika : Shinyanga, 1934, No. 47 ; tunnelling in cotton stems, locally very destructive. Tabora, 1935, No. 133, from a small nest in the base of an *Amitermes* mound. Songea, 1935, No. 115, from a nest in the side of a large conical mound of *Macrotermes bellicosus*. Lindi, 1938, No. 339 ; from earth runs on the trunks of Soap-nut trees.

This small species has been found to be widely distributed in East Africa, as the above selection of localities indicates.

### *Crenitermes albotarsalis* (Sjöstedt).

*Eutermes albotarsalis* Sjöstedt, 1897, *Ent. Tidskr.* **18** : 125. (Cameroon.)
*Crenitermes albotarsalis* Sjöstedt, 1926, *K. svenska. Vetensk. Akad. Handl.* 3 : 212. (French Congo ; Belgian Congo, Chinchoxo, Mukimbungu, Elisabethville.)

Tanganyika : Iringa, 1937, No. 222 ; one soldier in a collection of *Cubitermes sp.*

Northern Rhodesia : Chinsi Hills, 1949 (Hope-Simpson, No. 4).

### **Pericapritermes gloveri** sp. n.

*Imago.*—Head, pronotum and abdominal tergites dark brown. Clypeus, thoracic sclerites and legs pale brown to buff. Wings tinged with brown, veins prominent.

Head oval, with large prominent eyes, and inflated clypeus. Ocelli irregular oval, barely visible from above, almost touching the eyes. Fontanelle in the centre of a shallow depression of the frons, surrounded by a small pale area. Antennae with 15 segments, the third being the smallest.

Pronotum not as wide as the head across the eyes ; anterior margin slightly concave, with rounded corners ; sides gently curved and converging towards the posterior ; posterior margin weakly concave with broadly rounded corners ; a median T-shaped area of pale colour contrasting with the dark background.

| | mm. |
|---|---|
| Length with wings | 13·00 |
| „ without wings | 6·00 |
| Width of head across the eyes | 1·28 |
| Length of head to tip of mandibles | 1·35 |
| „ of head to base of mandibles | 0·88 |
| Diameter of eye | 0·36 |
| „ of ocellus (maximum) | 0·18 |
| Distance between eye and ocellus | 0·04 |
| Width of pronotum | 1·02 |
| Length of pronotum | 0·65 |
| „ of hind tibia | 1·43 |
| Anterior wing | 9·3 × 1·5 |

*Queen.*—As alate, but with abdomen distended to give a total length of 27 mm. Intersegmental membrane of abdomen buff in colour, with numerous small yellow flecks. Pronotum slightly larger and paler than alates.

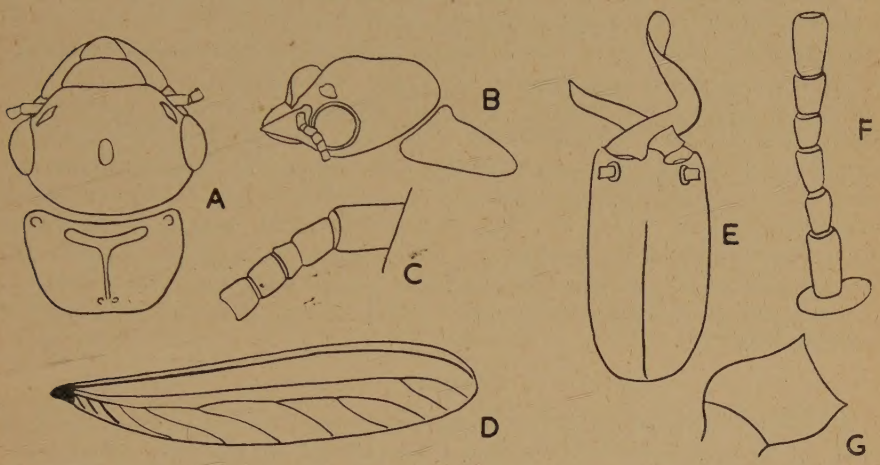


FIG. 1.—*Pericapritermes gloveri* sp. n. (A) Head and prothorax of imago; (B) the same, lateral view; (C) basal segments of antenna of imago; (D) fore wing; (E) head of soldier; (F) basal segments of soldier antenna; (G) labrum of soldier.

*Soldier.*—Head yellow with dark median line, antennae brown, mandibles black with reddish bases, body and legs buff.

Head large, rectangular with broadly rounded posterior corners, twice as long as wide (2 : 1·07). Antennae with 14 segments, the fourth segment shortest, the second slightly longer, the third shorter than the fifth. Labrum strongly asymmetrical, with curved sides and pointed corners. Mandibles large, the left folded upwards in the middle and with a rounded tip; the right flat with a pointed tip.

| | mm. | (Mean of 5.) |
|---|---|---|
| Length of head with mandibles | 3·73–3·94 | 3·86 |
| „ of head to base of mandible | 2·27–2·40 | 2·35 |
| Width of head | 1·25–1·28 | 1·26 |
| Length of left mandible | 1·46–1·57 | 1·53 |
| Pronotum width | 0·73–0·85 | 0·79 |
| „ length | 0·29–0·33 | 0·31 |
| Length of hind tibia | 1·17–1·20 | 1·18 |

This species is close to *P. heteronotus* Silvestri. It differs in the imago by having a larger head with the ocelli placed closer to the eyes, and in the soldiers by their smaller size. We are indebted to Dr. A. E. Emerson for comparing soldiers with those in his collection.

TANGANYIKA TERRITORY: Kapondwa, near Kasanga on Lake Tanganyika. (*P. E. Glover*, 11.xii.48) soldiers and a queen.

NORTHERN RHODESIA: Kalambo Falls, south bank of river. (*P.E. Glover*, 20.xii.48) alates and soldiers.

Additional locality—TANGANYIKA: Kakoma, fifty miles south of Tabora. (*P. E. Glover*, v.48).

After finding four soldiers in a *Cubitermes*-like mound in the *Brachystegia* woodland south of Tabora, Dr. P. E. Glover, acquainted of the interest attached to the discovery of this genus in East Africa, proceeded to obtain abundant material further to the south-west, on either side of the Kalambo River. Regarding the Kapondwa specimens, Dr. Glover writes : " The mound was on stony ground on the crest of a small hill in *Brachystegia-Isoberlinnia* woodland. It was built against a large boulder, its upper part was of the ' pagoda ' type and it was about 3 feet high by 2 feet in diameter. The upper part of the mound was inhabited exclusively by *Cubitermes*, but about a foot from the ground and in the part of the mound which lay against the face of the boulder there were numerous *Pericapritermes*. . . . There was a chamber about 5 cm. long by 2 cm. broad by 1 cm. in height in which were a queen, a king and numerous soldiers and workers. . . . The soldiers jump like fleas when they are disturbed. With a special effort a soldier may jump about 6 inches (by snapping apart the mandibles), but usually the jump is only two to three inches in length."

## Summary.

Details are given here of seven species of termites from East Africa, of which one is a new species and three others are new records for the area. The occurrence of the genera *Pericapritermes* and *Crenitermes* in East Africa adds considerably to their known area of distribution. *Cryptotermes dudleyi* is an interesting introduction to the African list. The three remaining species are recorded as additions to the territorial lists already published for Tanganyika (1936, *Bull. ent. Res.* **27** : 361–368) and Uganda (1948, *Proc. R. ent. Soc. Lond.* (B) **17** : 73–83), previous references being restricted to single localities in adjacent territories.

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**41, Queen's Gate, S.W. 7**

1951
Wednesday, March 7
" April 4
" May 2
" June 6

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